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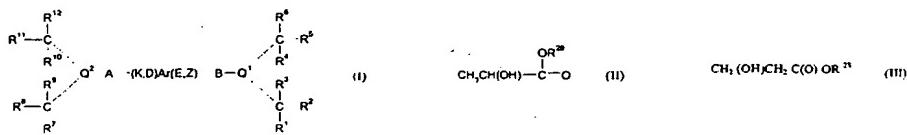
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(54) Title: CARBOXYLATION OF VINYL ACETATE



(57) Abstract: The present invention relates to the carbonylation of an ester, specifically vinyl acetate. The process comprises the carbonylation of vinyl acetate comprising reacting vinyl acetate with carbon monoxide in the presence of a source of hydroxyl groups and of a catalyst system, the catalyst system obtainable by combining: (c) a metal of Group VIII B or a compound thereof; and (d) a bidentate phosphine of general formula (I). A process for the production of a lactate ester or acid of formula (II), comprising the steps of carbonylating vinyl acetate with carbon monoxide in the presence of a source of hydroxyl groups and of a catalyst system is also described. A process for the production of 3-hydroxy propanoate ester or acid of formula (III) comprising the steps of: carbonylating vinyl acetate with carbon monoxide in the presence of a source of hydroxyl groups and of a catalyst system also forms an aspect of the invention.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER				
IPC 7	C07C67/347	C07C67/31	C07C69/716	C07C69/68

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 495 548 A (SHELL INT RESEARCH) 22 July 1992 (1992-07-22) cited in the application page 2, line 1 - line 2 page 2, line 36 -page 3, line 6 page 3, line 25 - line 31 page 3, line 39 - line 50 Tables and II, example XII page 4, line 2 - line 15; claims 1,5-7,9-12 --- -/--	1-28

Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

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Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel: (+31-70) 340-2040, Tx: 31 651 epo nl. Fax: (+31-70) 340-3016	Seelmann, M

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>WO 01 65583 A (BALDAUF JOSEF ;NOERL GERALD (DE); SIEMENS AG (DE)) 7 September 2001 (2001-09-07) cited in the application page 1, line 1 - line 24 page 2, line 18 - line 25 page 3, line 11 -page 5, line 24 page 6, line 13 - line 28 page 7, line 19 - line 22 page 7, line 29 -page 8, line 7 page 7, line 13 - line 21 page 9, line 8 - line 28 page 10, line 20 - line 22 claims 1,6-10; example 6; table III ----</p>	1-28
A	<p>US 4 377 708 A (MORRIS DONALD E) 22 March 1983 (1983-03-22) column 1, line 5 - line 51; claims 1,7-9,13-17; examples 2-7,10 column 9, line 37 -column 10, line 24 ----</p>	1-28
A	<p>US 4 500 727 A (KITAMURA TAKANORI ET AL) 19 February 1985 (1985-02-19) column 1, line 6 - line 8 column 2, line 63 -column 3, line 58 column 4, line 23 - line 34 column 5, line 4 - line 25 column 7, line 56 -column 8, line 7 column 8, line 38 - line 42 column 9, line 2 - line 12; claims 1-10; example 1 -----</p>	1-28

INTERNATIONAL SEARCH REPORT

PCT/GB 03/04679

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 0495548	A	22-07-1992		CA 2059236 A1 DE 69204691 D1 DE 69204691 T2 EP 0495548 A2 ES 2077337 T3 JP 3233670 B2 JP 5058949 A CA 2059233 A1 CN 1063277 A ,B DE 69210054 D1 DE 69210054 T2 EP 0495547 A2 ES 2088082 T3 IN 185157 A1 JP 3270098 B2 JP 4334340 A KR 220824 B1 SG 45352 A1	16-07-1992 19-10-1995 11-04-1996 22-07-1992 16-11-1995 26-11-2001 09-03-1993 16-07-1992 05-08-1992 30-05-1996 12-12-1996 22-07-1992 01-08-1996 25-11-2000 02-04-2002 20-11-1992 15-09-1999 16-01-1998
WO 0165583	A	07-09-2001		EP 1130614 A1 WO 0165583 A1 EP 1259972 A1 US 2002153238 A1	05-09-2001 07-09-2001 27-11-2002 24-10-2002
US 4377708	A	22-03-1983		AU 520213 B2 AU 4071578 A BE 871264 A1 CA 1126289 A1 DE 2844778 A1 FR 2405919 A1 GB 2006208 A ,B IT 1099745 B JP 54063020 A NL 7810218 A	21-01-1982 17-04-1980 13-04-1979 22-06-1982 26-04-1979 11-05-1979 02-05-1979 28-09-1985 21-05-1979 18-04-1979
US 4500727	A	19-02-1985		JP 1049697 B JP 1568111 C JP 57156442 A JP 57209250 A JP 57209251 A DE 3210617 A1 FR 2502144 A1 FR 2515638 A1	25-10-1989 10-07-1990 27-09-1982 22-12-1982 22-12-1982 30-09-1982 24-09-1982 06-05-1983